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AUTHOR Paul, Richard; Nosich, Gerald M.
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ABSTRACT

This document provides specific examples of what is involved in applying intellectual criteria and standards to students' reasoning, focusing on elements of reasoning (EORs). The significance of reasoning having elements and the need for standards in assessing reasoning are described. The following are the EORs: (1) purpose, goal, or end in view (all reasoning has a purpose); (2) question at issue or problem to be solved (all reasoning is an attempt to figure something out, settle some question, or solve some problem); (3) point of view or frame of reference (all reasoning is done from some viewpoint); (4) the empirical dimension of reasoning (all reasoning is based on data, information, and/or evidence); (5) the conceptual dimension of reasoning (all reasoning is expressed through and shaped by concepts and ideas); (6) assumptions (all reasoning is based on assumptions); (7) implications and consequences (all reasoning leads somewhere and has implications and consequences); and (8) inferences (all reasoning contains inferences by which conclusions are drawn and meaning is given to data). The interface between EORs and standards is considered. Eight three-columned charts, one for each of the EORs, briefly characterize differences between how good and bad reasoners handle components of their reasoning. The charts provide samples of feedback that teachers might give to students about each component of students' performance as reasoners. (RLC)

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Using Intellectual Standards to Assess Student Reasoning

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with Gerald M. Nosich

Abstract

In this paper, co-authored by Richard Paul and Gerald Nosich, the emphasis is on providing the reader with specific examples of what is involved in applying intellectual criteria and standards to students' reasoning, especially with reference to the "elements of reasoning" which, they explain, are the logical components of all reasoning. Paul and Nosich first explain the significance of reasoning having "elements", then the need for "standards" in assessing reasoning. They then take us through each of the elements of reasoning, giving us a general sense of the interface between elements and standards, and then, finally, provide a series of three columned charts, one for each of the elements of reasoning. Each chart briefly characterizes the differences between how good and bad reasoners handle the components of their reasoning, as well as articulating samples of the sort of feedback which we as teachers might give to students with regard to each of the components of their performance as reasoners. Their goal is clearly both theoretical and practical.

To assess student reasoning requires that we focus our attention as teachers on two inter-related dimensions of reasoning. The first dimension consists of the elements *of reasoning*; the second dimension consists of the *universal intellectual standards* by which we measure student ability to use, in a skillful way, each of those elements of reasoning.

Elements of reasoning. Once we progress from thought which is purely associational and undisciplined, to thinking which is conceptual and inferential, thinking which attempts in some intelligible way to figure something out, in short, to reasoning, then it is helpful to concentrate on what can be called "the elements of reasoning". The elements of reasoning are those essential dimensions of reasoning whenever and wherever it occurs. Working together, they shape reasoning and provide a general logic to the use of reason. We can articulate these elements by paying close attention to what is implicit in the the act of figuring anything out by the the use of reason. These elements, then — purpose, question at issue, assumptions, inferences, implications, point of view, concepts and evidence — constitute a central focus in the assessment of student thinking.

Standards of Reasoning. When we assess student reasoning, we want to evaluate, in a reasonable, defensible, objective way, not just *that* students are reasoning, but *how well* they are reasoning. We will be assessing not just that they are using the elements of reasoning, but the degree to which they are using them well, critically, in accord with appropriate intellectual standards.

To assess a student response, whether written or oral, in structured discussion of content or in critical response to reading assignments, by how *clearly* or *completely* it states a position, is to assess it on the basis of a standard of reasoning. Similarly, assessing student work by how *logically* and *consistently* it defends its position, by how *flexible* and *fair* the student is in articulating other points of view, by how *significant* and *realistic* the student's purpose is, by how *precisely* and *deeply* the student articulates the question at issue — each of these is an evaluation based on standards of reasoning.

Distinct from such reasoning standards are other standards that teachers sometimes use to assess student work. To evaluate a student response on the basis of how concisely or elegantly it states a position is to use standards that are inappropriate to assessing student reasoning. Similarly unrelated to the assessment of reasoning is evaluating student work by how humorous, glib, personal or sincere it is, by how much it agrees with the teacher's views, by how "well-written" it is, by how exactly it repeats the teacher's words, by the mere quantity of information it contains. The danger is that such standards are often conflated with reasoning standards, often unconsciously, and students are assessed on grounds other than the degree to which they are reasoning well.

The basic conditions implicit whenever we gather, conceptualize, apply, analyze, synthesize, or evaluate information — the elements of reasoning — are as follows:

1) Purpose, Goal, or End in View. Whenever we reason, we reason to some end, to achieve some objective, to satisfy some desire or fulfill some need. One source of problems in student reasoning is traceable to defects at the level of goal, purpose, or end. If the goal is unrealistic, for example, or contradictory to other goals the student has, if it is confused or muddled in some way, then the reasoning used to achieve it is problematic.

A teacher's assessment of student reasoning, then, necessarily involves an assessment of the student's ability to handle the dimension of purpose in accord with relevant intellectual *standards*. It also involves giving *feedback* to students about the degree to which their reasoning meets those standards.

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Purpose

(All reasoning has a purpose.)

Fundamental Standards: 1) Clarity of Purpose, 2) Significance of Purpose, 3) Achievability of Purpose, 4) Consistency

Failures of Purpose: 1) Unclear Purpose, 2) Trivial Purpose, 3) Unrealistic Purposes, 4) Contradictory Purposes

Good Reasoners:	*Bad Reasoners:*	*Feedback to Students:*
take the time to state their purpose clearly	are often unclear about their central purpose	(-) You have not made the purpose of your reasoning clear. What are you trying to achieve? Whom are you trying to persuade? (+) Your paper reflects an excellent sense of unity of purpose. It all fits together like pieces of a puzzle.
distinguish it from related purposes	oscillate between different, sometimes contradictory purposes	(+) You do a good job of distinguishing different but related goals. (-) You seem to have a number of different purposes in mind. I am not sure how you see them as related. You seem to be going off in somewhat different directions.
periodically remind themselves of their purpose to determine whether they are straying from it	lose track of their fundamental end or goal	(-) After the second paragraph you seem to wander from your purpose. How do your 3rd and 4th paragraphs relate to your central goal? (+) I like the way you periodically show the reader how the points you are making all add up to a central conclusion.
adopt realistic purposes and goals	adopt unrealistic purposes, set unrealistic goals	(+) You make a wise decision not to try to accomplish too much. Accomplishing a little, well, is almost always better than failing in a grand and sweeping design. (-) You try to accomplish too much in so short a paper.
choose significant purposes and goals	adopt trivial purposes and goals as if they were significant	(-) Your paper would have been stronger if you had chosen a more important goal. (+) The goal of your paper is worthwhile and well-chosen.
choose goals and purposes that are consistent with other goals and purposes they have chosen	inadvertently negate their own purposes do not monitor their thinking for inconsistent goals	(-) One part of your paper seems to undermine what you are trying to accomplish in another part. You first try to persuade the reader how realistic Dickens' characters are, but after that you seem to be showing that they are caricatures. (+) Your unity of purpose is reflected in every section of your paper.
adjust their thinking regularly to their purpose	do not adjust their thinking regularly to their purpose	

Is the student's purpose — in an essay, a research project, an oral report, a discussion — *clear*? Is the purpose *significant* or trivial or somewhere in between? Is the student's purpose, according to the most judicious evaluation on the teacher's part, *realistic*? Is it an *achievable* purpose? Does the student's overall goal dissolve in the course of the project, does it change, or is it *consistent* throughout? Does the student have contradictory purposes?

2) Question at Issue, or Problem to be Solved. Whenever we attempt to reason something out, there is at least one question at issue, at least one problem to be solved. One area of concern for assessing student reasoning, therefore, will be the formulation of the question to be answered or problem to be solved, whether with respect to the student's own reasoning or to that of others.

Assessing skills of mastery of this element of reasoning requires assessing — and giving feedback on — students' ability to formulate a problem in a *clear* and *relevant* way. It requires giving students direct commentary on whether the question they are addressing is an important one, whether it is *answerable*, on whether they understand the requirements for settling the question, for solving the problem.

3) Point of View, or Frame of Reference. Whenever we reason, we must reason within some point of view or frame of reference. Any "defect" in that point of view or frame of reference is a possible source of problems in the reasoning.

A point of view may be too narrow, too parochial, may be based on false or misleading analogies or metaphors, may contain contradictions, and so forth. It may be restricted or unfair. Alternatively, student reasoning involving articulation of their point of view may meet the relevant standards to a significant degree: their point of view may be *broad, flexible, fair;* it may be *clearly* stated and *consistently* adhered to.

Feedback to students would involve commentary noting both when students meet the standards and when they fail to meet them. Evaluation of students' ability to handle the dimension of point of view would also appropriately direct students to lines of reasoning that would promote a richer facility in reasoning about and in terms of points of view.

4) The Empirical Dimension of Reasoning. Whenever we reason, there is some "stuff," some phenomena about which we are reasoning. Any "defect," then, in the experiences, data, evidence, or raw material upon which a person's reasoning is based is a possible source of problems.

Students would be assessed and receive feedback on their ability to give evidence that is gathered and reported *clearly, fairly,* and *accurately.* Does the student furnish data at all? Is the data *relevant*? Is the information *adequate* for achieving the student's purpose? Is it applied *consistently,* or does the student distort it to fit her own point of view?

5) The Conceptual Dimension of Reasoning. All reasoning uses some ideas or concepts and not others. These concepts can include the theories, principles, axioms and rules implicit in our reasoning. Any "defect" in the concepts or ideas of the reasoning is a possible source of problems in student reasoning.

Feedback to students would note whether their understanding of theories and rules was *deep* or merely superficial. Are the concepts they use in their reasoning *clear* ones? Are their ideas *relevant* to the issue at hand, are their principles slanted by their point of view?

6) Assumptions. All reasoning must begin somewhere, must take some things for granted. Any "defect" in the assumptions or presuppositions with which the reasoning begins is a possible source of problems for students.

Assessing skills of reasoning involves assessing their ability to recognize and articulate their assumptions, again according to the relevant standards. The student's assumptions may be stated *clearly* or unclearly; the assumptions may be *justifiable* or unjustifiable, *crucial* or extraneous, *consistent* or contradictory. The feedback students receive from teachers on their ability to meet the relevant standards will be a large factor in the improvement of student reasoning.

7) Implications and Consequences. No matter where we stop our reasoning, it will always have further implications and consequences. As reasoning develops, statements will logically be entailed by it. Any "defect" in the implications or consequences of our reasoning is a possible source of problems.

The ability to reason well is measured in part by an ability to understand and enunciate the implications and consequences of the reasoning. Students therefore need help in coming to understand both the relevant standards of reasoning out implications and the degree to which their own reasoning meets those standards.

When they spell out the implications of their reasoning, have they succeeded in identifying *significant* and *realistic* implications, or have they confined themselves to unimportant and unrealistic ones? Have they enunciated the implications of their views clearly and *precisely* enough to permit their thinking to be evaluated by the validity of those implications?

8) *Inferences.* Reasoning proceeds by steps in which we reason as follows: "Because this is so, that also is so (or probably so)," or "Since this, therefore that." Any "defect" in such inferences is a possible problem in our reasoning.

Assessment would evaluate students' ability to make sound inferences in their reasoning. When is an inference *sound*? When it meets reasonable and relevant standards of inferring. Are the inferences the student draws *clear*? Are they *justifiable*? Do they draw *deep* conclusions or do they stick to the trivial and superficial? Are the conclusions they draw *consistent*?

Question at Issue / Central Problem

(All reasoning is an attempt to figure something out to settle some question, solve some problem.)

Fundamental Standards: 1) Clarity of Question, 2) Significance of Question, 3) Answerability, 4) Relevance
Flawed Questions: 1) Unclear, 2) Insignificant, 3) Not answerable, 4) Irrelevant
Principle: To settle a question you must understand it and its requirements.

Good Reasoners:	*Bad Reasoners:*	*Feedback to Students:*
are clear about the question they are trying to settle	are often unclear about the kind of question they are asking	(-) The main question at issue is never made clear. (+) You do a good job of clarifying the question at issue.
can re-express a question in a variety of ways	express questions vaguely and find them difficult to reformulate	(-) You need to reformulate your question in a couple of ways to recognize the complexity of it. (+) I like the way you reformulate your question in different ways. It helps the reader see it from different points of view.
can break a question into sub-questions	are unable to break down the questions they are asking	(+) You do a good job of analyzing the main question into sub-questions. (-) It would be easier to solve your main problem if you would break it down somewhat.
have sensitivity to the kind of question they are asking routinely distinguish questions of different types	have little sensitivity to the kind of question they are asking confuse questions of different types often respond inappropriately to the questions they ask	(-) You are confusing a legal question with a moral one. (+) You do a good job of keeping the economic issues separate from the social ones.
distinguish significant from trivial questions	confuse trivial questions with significant ones	(-) You begin with a significant question but seem to wander off into some insignificant ones. (+) The problem you raise is a very significant one.
distinguish relevant questions from irrelevant ones	confuse irrelevant questions with relevant ones	(-) The questions you raise in the second part of your paper do not seem to be relevant to the main question at issue.
are sensitive to the assumptions built into the questions they ask	often ask loaded questions	(-) The way you put the question is loaded. You are taking for granted from the outset the correctness of your own position. (+) You put your question in a neutral and unbiased form and you don't allow yourself to be distracted by irrelevant questions.
distinguish questions they can answer from questions they can't		

Point of View

(All reasoning is done from some point of view.)

Fundamental Standards: 1) Flexibility in Point of View, 2) Fairness of Point of View, 3) Clarity of Point of View, 4) Breadth of Point of View

Defects in point of view: 1) Restricted, 2) Biased, 3) Unclear, 4) Narrow

Principle: Reasoning is better when multiple, relevant points of view are sought out, articulated clearly, empathized with fairly and logically, applied consistently and dispassionately.

Good Reasoners:	*Bad Reasoners:*	*Feedback to Students:*
keep in mind that people have different points of view, especially on issues that are controversial	don't realize that people approach the question at issue from different points of view	(-) You haven't articulated the point of view from which you are approaching this issue.
consistently articulate other points of view and reason from within those points of view	are unable to see issues from points of view that are significantly different from their own personal/cultural one; i.e., are unable to reason empathetically from within alien points of view	(+) You have reasoned out this controversial issue clearly from multiple relevant points of view.
seek other viewpoints especially when the issue is one they believe in passionately	can sometimes enunciate other points of view when the question at issue is emotionally uncharged, but can no longer do so when it is an issue they are deeply committed to	(-) You have characterized your own point of view, but what are the most significant aspects of the problem from X's point of view? (+)You have done an excellent job of spelling out the other side of this issue. This is especially difficult when a person is as deeply committed to one side as you are. (-) This is an unfair way of presenting X's point of view.
confine their monological reasoning to problems that are clearly monological	confuse multilogical with monological issues by insisting that there is only one frame of reference within which a particular multilogical question must be decided	(+/-) Is the question here monological or multilogical? How can you tell? (-) You are reasoning as if only one point of view is relevant to this issue.
have insight into areas and problems where they are most likely to be prejudiced	are unaware of their own prejudices	(+/-) Is this prejudice or reasoned judgment?
approach problems and issues with a richness of vision and an appropriately broad point of view	reason from within inappropriately narrow and superficial points of view	(-) Your approach to this question is too narrow. (+) You have considered this problem with the depth it requires.

Empirical Dimension

(All reasoning is based on data, information, evidence.)

Fundamental Standards: 1) Clear Evidence, 2) Relevant Information, 3) Fairly Gathered and Reported Evidence, 4) Accurate Data, 5) Adequate Evidence, 6) Consistently Applied Data

Flawed Empirical Dimension: Unclear, Unfairly or Self-Servingly Gathered, Inaccurate, Insufficient

Principle: Reasoning can only be as sound as the empirical evidence it is based on.

Good Reasoners:	*Bad Reasoners:*	*Feedback to Students:*
assert a claim only when they have sufficient evidence to back it up	assert claims without considering any evidence	(+) You have given a clear statement of the relevant data. (-) This claim can't merely be asserted. It needs to be supported by evidence or data.
can articulate and therefore evaluate the evidence behind their claims	don't articulate their evidence even when they have it, and so are less able to subject it to rational scrutiny	(+/-) I think you probably *have* evidence to support your claim here; you just haven't articulated it.
actively search for information *against* (not just *for*) their own position	gather evidence only when it supports their own point of view	(+) You have gathered and reported evidence fairly on both sides of this issue. (+/-) Where is a good place to look for evidence on the opposite side? Have you looked there?
focus on relevant information and disregard information or data that is irrelevant to the question at issue	do not carefully distinguish between relevant data and irrelevant data	(+) The information you cite is relevant and to the point. (-) The data you supply is irrelevant. (+/-) How is this relevant to the claim you are making?
draw conclusions only to the extent that they are supported by the data	make inferences that go beyond what the data support	(-) Though you give some evidence to back up your claim, the claim goes beyond the evidence you've cited. (+) Your claims are well-supported by the evidence you cite.
state their evidence clearly and fairly	distort the data, or state it inaccurately	(+) This is a clear and coherent presentation of the pertinent information.

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Concepts and Ideas

(All reasoning is expressed through, and shaped by, concepts and ideas.)

Fundamental Standards: 1) Clarity of Concepts, 2) Relevance of Concepts, 3) Depth of Concepts, 4) Neutrality of Concepts

Failure of Concepts: 1) Unclear, 2) Irrelevant, 3) Superficial, 4) Biased

Principle: Reasoning can only be as clear, relevant, and deep as the concepts which shape it.

Good Reasoners:	*Bad Reasoners:*	*Feedback to Students:*
are aware of the key concepts and ideas they use	are unaware of the key concepts and ideas they use	(-) The concept of democracy, central to your essay, is not analyzed in your paper. You assume that if people are in any sense allowed to vote, they are living in a democracy. You need to consider the idea of democracy more deeply. If people are systematically indoctrinated and manipulated into voting in a way contrary to their self-interest, are the "people" in charge? (+) You do well in distinguishing training, socialization, indoctrination, and education.
are able to explain the basic implications of the key words and phrases they use	do not accurately explain basic implications of their key words and phrases	(+) Yes, the word 'cunning' has negative implications that the word 'clever' does not.
are able to distinguish special, non-standard uses of words from standard uses	are not able to recognize when their use of a word or phrase departs from educated usage	(-) Where did you get your definition of this central concept? (-) You assume that abortion is murder, but you won't find a dictionary that defines it as "the murder of a very young person". Don't put your conclusion into the definition.
are aware of irrelevant concepts and ideas use concepts and ideas in ways relevant to their functions	use concepts in ways inappropriate to the subject or issue	(-) Do you think that the notion of "dog-eat-dog" applies to moral situations? Isn't the question one of moral responsibility?
can distinguish superficial from deep concepts	confuse superficial with deep concepts	

Assumptions

(All reasoning is based on assumptions.)

Fundamental Standards: 1) Clarity of Assumptions, 2) Justifiability of Assumptions, 3) Consistency of Assumptions

Failure of assumptions: 1) Unclear, 2) Unjustified, 3) Contradictory

Principle: Reasoning can only be as sound as the assumptions it makes.

Good Reasoners:	*Bad Reasoners:*	*Feedback to Students:*
make assumptions that are clear	often make assumptions that are unclear	(-) It is not clear what you are assuming. (-) It is not clear what you base your main assumption on. (+) Your assumptions seem clear and reasonable.
make assumptions that are reasonable	often make assumptions that are not justified often make assumptions that are unreasonable	(-) It seems unreasonable to make assumptions about the future based on just one experience from the past.
make assumptioastent with each other	often make assumptions that are contradictory	(-) The assumptions you make in the first part of your paper seem to contradict the assumptions you make in the last section of your paper.

Implications and Consequences

(All reasoning leads somewhere, has implications and consequences.)

Fundamental Standards: 1) Significance of Implications, 2) Realistic Nature of Implications, 3) Clarity of Articulated Implications, 4) Precision of Articulated Implications, 5) Completeness of Articulated Implications

Flawed Implications and Consequences: 1) Unimportant, 2) Unrealistic, 3) Unclear, 4) Imprecise, 5) Incomplete

Principle: To reason through an issue or decision, you must understand the implications and consequences that follow from it.

Good Reasoners:	*Bad Reasoners:*	*Feedback to Students:*
trace out a number of significant implications and consequences of their reasoning	trace out few or none of the implications and consequences of holding a position or making a decision	(-) You don't spell out the consequences of the action you are advocating. (+/-) If you took this course of action, what other consequences would follow.
articulate the implications and consequences clearly and precisely	are unclear and imprecise in the consequences they articulate	(+) You have spelled out the implications of your reasoning in as clear and precise a way as the subject permits. (-) You will be much clearer about whether the action is reasonable if you are more precise when you delineate the consequences likely to follow from it.
search for negative as well as for positive consequences	trace out only the consequences they had in mind at the beginning, either positive or negative, but usually not both	(+/-) You've done a good job of spelling out some positive consequences of the decision at issue, but what are some of the negative consequences?
anticipate the likelihood of unexpected negative and positive implications	are surprised when their decisions have unexpected consequences	(-) In addition to the ones you've traced out, there are several important consequences you've failed to anticipate. (+/-) Are there other factors in the decision that will probably lead to significant consequences other than those you have in mind?

Inference

(All reasoning contains inferences by which we draw conclusions and give meaning to data.)

Fundamental Standards: 1) Clarity of Inferences, 2) Justifiability of Inferences, 3) Profundity of Conclusions, 4) Reasonability of Conclusions, 5) Consistency of Conclusions

Failure of Inferences and Conclusions: 1) Unclear, 2) Unjustified, 3) Superficial, 4) Unreasonable, 5) Contradictory

Principle: Reasoning can only be as sound as the inferences it makes and conclusions it comes to.

Good Reasoners:	*Bad Reasoners:*	*Feedback to Students:*
make inferences that are clear and precise	often make inferences that are unclear	(-) It is not clear what your main conclusion is. (-) It is not clear what you base your main conclusion on. (+) Your reasoning is very clear and easy to follow.
usually make inferences that follow from the evidence or reasons presented	often make inferences that do not follow from the evidence or reasons presented	(-) The conclusion you come to does not follow from the evidence or reasons presented. (+) You justify your conclusion well with supporting evidence and good reasons.
often make inferences that are deep rather than superficial	often make inferences that are superficial	(+) Your central conclusion is well-thought-out and goes right to the heart of the issue. (-) Your conclusion is justified, but it seems superficial, given the problem.
often make inferences or come to conclusions that are reasonable	often make inferences or come to conclusions that are unreasonable	(-) It is unreasonable to infer a person's personality from their ethnic group.
make inferences or come to conclusions that are consistent with each other	often make inferences or come to conclusions that are contradictory	(-) The conclusions you come to in the first part of your paper seem to contradict the conclusions that you come to in the last section of your paper. (+) Your conclusions are reasonable, given the evidence you presented; furthermore, they are mutually consistent.